

or fractions of things. Much useful, if elementary, information is conveyed in small doses as the child is able to receive it, but there is nothing childish in the matter or the manner. We should say that the best way to use the book would be for the parent (or governess) to master each lesson well beforehand, so that there should be little or no reference to the book during lesson-time, except, perhaps, for the purpose of looking at the illustrative drawings. We feel sure that when the "good bye" is reached there will be few to call Arithmos unkind names and say "he is a horrid, cross old thing," and that "they hate him, and wish such a giant had never been made."

A Treatise on Elementary Trigonometry. By the Rev. J. B. Lock. (Macmillan, 1882.)
Introduction to Plane Trigonometry. By the Rev. T. G. Vyvyan. (Deighton, Bell, and Co., 1882.)

BOTH these works are elementary: their scope is in the main limited by the requirements of the Previous Examination at Cambridge, and of the Entrance Examinations for the army. Mr. Lock's is by far the fuller work, and is well adapted for a student who has not constantly at hand the assistance of a private tutor; in fact, such a reader, if of fair intelligence, might be independent of extraneous aid, if he have previously grounded himself carefully in geometry and elementary algebra. The work contains a very large collection of good (and not too hard) examples. The only fault—if we must grumble—is that there is too much, we think, for ordinary school teaching. As Mr. Vyvyan remarks, "in all public schools but a few hours a week can be given to mathematics by the generality of boys," and trigonometry has to take, in general, a very small portion of that limited time. But Mr. Lock is to be congratulated, when so many "Trigonometries" are in the field, on having produced so good a book, for he has not merely availed himself of the labours of his predecessors, but by his treatment of a well-worn subject has invested the study of it with interest. The figures are numerous, and are drawn so that the salient features arrest the eye at once.

Mr. Vyvyan's work also is well adapted to the end he has in view. He aims at producing a book which may fairly be mastered by any schoolboy of average ability, whose sole desire in studying this branch (or any other branch of mathematics) is to satisfy the University examiners in an early stage of residence, that so he may be free to read other subjects, and bid farewell to mathematics.

The matter is clearly, though somewhat concisely put, and is sufficient in quantity for Mr. Vyvyan's purpose, which is not to bring out a book that will render a schoolboy or other junior student independent of the assistance of a master—this he considers to be an impossible task. We ourselves have found that very much explanation is required by the generality of pupils. There is a sufficient collection and variety of exercises.

We cannot say that either text-book will supersede all other text-books, but each merits, and will no doubt secure a very fair circulation in schools. Mr. Lock's being the fuller, is likely to be the more generally acceptable.

An Elementary Treatise on Conic Sections. By Charles Smith, M.A. (London: Macmillan, 1882.)

A THOROUGHLY excellent elementary treatise. For a long time we have been exercised in mind when asked to recommend a book on Conics. To all its predecessors, with their varying shades of goodness and badness, we had some objection or other to urge. Mr. Smith has just met our want; his book is right up to the time, and is admirably adapted for the preparation of pupils for college scholarships; for students at the university it is a fitting introduction to that as yet unapproached work, Salmon's treatise on these curves. The text is excellent, full in

alternative proofs, and suggestive in its methods; the numerous worked-out exercises, in addition to those collected at the close of the several chapters, render the reader independent of any other work. We think the title-page should state that it is an "analytical" treatise on conics.

LETTERS TO THE EDITOR

[The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts. No notice is taken of anonymous communications.]

[The Editor urgently requests correspondents to keep their letters as short as possible. The pressure on his space is so great that it is impossible otherwise to ensure the appearance even of communications containing interesting and novel facts.]

The Darwin Memorial

THE note in NATURE, vol. xxvi. p. 87, on the Darwin memorial, says that there is to be a fund associated with the name of the great naturalist, which shall be devoted to the furtherance of biological science. Probably most biologists would agree that one of the best plans for effecting this object would be one, the idea of which originated with Mr. Sydney Hickson, of Downing College, Cambridge, who is at present on the staff of the Oxford Biological Laboratory. This plan is to establish out of the fund a marine zoological station somewhere on the English coast, that of Devonshire, for example. Mr. Hickson has advocated this course in a letter to the *Times*, where he pointed out that Italy, Austria, and France have zoological stations, while we have none, a fact which is one of the many signs that the teachings of Darwin have aroused more enthusiasm and activity abroad than at home. If you would give publicity to this suggestion it would be certain to come under the notice of the Memorial Committee and of biologists generally.

J. T. CUNNINGHAM

Cottons, Romford, May 27

Comet α 1882

OWING to recent bad weather, the only opportunity we have had here of observing the spectrum of the comet was on June 4.

Unfortunately our view was obstructed by clouds just as it grew dusk, but at 11.30 I managed to obtain a glimpse for a few moments. The nucleus gave a very bright continuous spectrum, with a marked increase of luminosity and widening of the spectrum in the yellow. I could see no lines or bands. I was not able to make any further observations, as the comet was on the point of disappearing behind a tree.

A. PERCY SMITH

Temple Observatory, Rugby, June 6

THIS comet was distinctly visible to the naked eye, at 11 p.m. on Sunday, June 4, in the north-west, about 5° to 10° above the horizon (being in a hilly country, I could not estimate it correctly), with a bright nucleus, and a tail about $1\frac{1}{2}^{\circ}$ in length. The sky had been overcast and stormy all day, but cleared up before midnight. I observed it from a hill-side about 400 feet above sea-level.

F. T. MOTT

Leicester

Meteors

ABSENCE from home on business connected with the Transit of Venus Expeditions prevented me sending you earlier notice of a very brilliant meteor, which was seen here and at several distant stations.

On May 4, at 9h. 31m. p.m., Mr. Rooney, one of the assistants of the Observatory, saw a large fire-ball of a light purple tint. It was first observed near the star Arcturus, and then it moved towards the Great Bear, passing between δ and ϵ Ursæ. It burst just under α Ursæ, when its train changed in colour from a purple tint into a brilliant red. It was visible for about five seconds, and lit up the whole garden.

Another assistant, Mr. Cullen, saw the same body from a place not far distant, and his account agreed well with the above.

A note from a friend at Clitheroe informs me that the meteor was seen in that town by several persons, and was as brilliant as the full moon.

Another observer, writing from Prestwich to the *Manchester Examiner and Times*, describes it as having moved from S.S.E. to N.N.W., passing a few degrees to the east of the zenith, and exploding and then vanishing at an angle (altitude) of 40° to 45° .

At Tarporley it was visible for thirty seconds, moving from E. to N.N.W.

The same fire-ball was also seen in Cheshire.

Stonyhurst Observatory, Whalley, May 31 S. J. PERRY

ON May 16, about 11 p.m., I saw a meteor that was, I think, the most terrific, as well as the grandest, I have ever happened to see. I reached my house about ten minutes afterwards, and at once wrote down, substantially, the following unvarnished account of the phenomenon. It may have been witnessed and recorded by some one elsewhere. If so, the observer may like to compare my record of it with his own:—I was walking westward, and I was about two miles south-west of Woodstock (as the crow flies). Suddenly my attention was drawn upward by a brilliant light. I then saw a meteor high up in the western sky, and a little south of the Great Bear. It was descending at an angle of 50° . Its speed was so moderate, that I got a good observation of it. Its seeming size was, I think, quite half that of the full moon. Its appearance was such as I never saw before: it struck me as being like a transparent lantern, or, rather, pail, full of burning matter. Its base was a sharply-defined broad cone. It looked as though let down from above by an unseen string, rather than falling. It seemed to be very near me. A flickering reddish flame rose, fitfully, straight up from the horizontal surface of its yellow-hued fiery mass. It vanished, without my seeing any scattering of sparks, when it was about half way between the Pointers and the horizon.

JOHN HOSKYNs-ABRAHAM

Combe Vicarage, near Woodstock, May 27

Earth-Tremors in Japan

AN article on earth-tremors, which appeared in the *Times* last November, seems to have attracted considerable attention in Japan, and a few facts respecting the work which has been attempted in the investigation of microseismic disturbances in this country, may possibly be of interest. In the *Transactions* of the Seismological Society of Japan we have already had three communications on this subject. Prof. H. M. Paul told us how, when searching for a site for the United States Naval Observatory at Washington, by watching the reflection of the image of a star in a vessel of mercury with a telescope, he was easily enabled to detect earth-tremors produced by a railway train at the distance of a mile.

Major H. S. Palmer, R.E., of Hong Kong, gave us an account of how, by digging a trench large enough to contain himself and his instruments when seeking for a station from which to make observations on the Transit of Venus, he practically escaped from earth-tremors which emanated from a railway line about 400 yards distant. As there are strong reasons for believing that many of the earthquakes which are felt in Yedo are produced by the faulting of the rocks, it was natural to assume that before the actual breakage took place there might be a crackling or gradual giving way which would be indicated to us by preceding earth-tremors.

In order to determine the presence of these earth-tremors, at the end of 1879 I commenced a series of experiments with a variety of apparatus, amongst which were microphones and sets of pendulum apparatus, very similar in general arrangement, but, unfortunately, not in refinement of construction, to the arrangements now being used in the Cavendish Laboratory.

The microphones were screwed on to the heads of stakes driven in the ground, at the bottom of boxed-in pits. In order to be certain that the records which these microphones gave were not due to local actions, such as birds or insects, two distinct sets of apparatus were used, one being in the middle of the lawn in the front of my house, and the other in a pit at the back of the house. The sensitiveness of these may be learnt from the fact that if a small pebble was dropped on the grass within six feet of the pit, a distinct sound was heard in the telephone, and a swing produced in the needle of the galvanometer placed in connection with these microphones. A person running or walking in the neighbourhood of the pits, had each of his steps so definitely recorded, that a Japanese neighbour, Mr. Masato, who assisted me in the experiments, caused the swinging needle of his galvanometer to close an electric circuit and ring a bell,

which, it is needless to say, would alarm a household. In this contrivance we have a hint as to how earth-tremors may be employed as thief-detectors.

The pendulum apparatus, one of which consisted of a 20 lb. bob of lead at the end of 20 feet of pianoforte wire provided with small galvanometer mirrors, and bifilar suspensions were also used in pairs. With this apparatus a motion of the bob relatively to the earth was magnified 1000 times, that is to say, if the spot of light which was reflected from the mirror moved a distance equal to the thickness of a sixpence, this indicated there had been a relative motion of the bob to the extent of 1000th part of that amount.

The great evil which every one has to contend with in Japan when working with delicate apparatus are the actual earthquakes, which stop or alter the rate of ordinary clocks.

Another evil which had to be contended with was the wind, which shook the house in which my pendulums were supported, and I imagine the ground by the motion of some neighbouring trees. A shower of rain also was not without its effects upon the microphones. After many months of tiresome observation, and eliminating all motions which by any possibility have been produced by local influence, the general result obtained was that there were movements to be detected every day and sometimes many times per day.

Although these observations, which I found required more attention than a private observer was enabled to give to them, have been discontinued, I sincerely hope they may be again taken up. My reason for this is that in a country like Japan, where earthquakes are in some part or other phenomena of everyday occurrence, we have excellent opportunities of determining whether any connection exists between earthquakes and earth-tremors. The idea that earth-tremors may be the forerunners of earthquakes is by no means novel, and that earth-tremors actually exist was demonstrated some years ago in Florence by Timoleo Bartelli, who made microscopic observations of the pointer of a pendulum, which, to free from local surface action, he suspended in a cell. The localities which I should recommend for the observations of earth-tremors would be as near as possible to some earthquake centre. The localisation of these centres, however, is a matter of some difficulty. The difficulty arises from the fact that good time observations on earthquakes have, so far as I am aware, never yet been obtained; and farther, although we are able with our seismographs to write down the direction in which the earthquakes shake us backwards and forwards, these directions by no means always tell us the direction in which an earthquake came, an east and west motion having sometimes been proved to have travelled broadside on up from the south.

A great assistance to the interpretation of the various records which an earthquake gives us on our seismographs is what I may call a barricade of post-cards. At the present moment Yedo is barricaded, all the towns around for a distance of one hundred miles being provided with post-cards. Every one of them is posted with a statement of the shocks which have been felt.

For the months of October and November it was found from the records of the post cards that nearly all the shocks came from the north and passed Yedo to the south-west. When coming in contact with a high range of mountains, they were suddenly stopped, as was inferred from the fact that the towns beyond this range did not perceive that an earthquake had occurred. This fact having been obtained, the barricade of post-cards has been extended to towns lying still farther north. The result of this has been that several earthquake origins have, so to speak, been surrounded or coralled, whilst others have been traced as far as the seashore. For the latter shocks earthquake hunting with post-cards has had to cease, and we have solely to rely upon our instruments. Having obtained our earthquake centres, at one or more of these our tremor instruments might be erected, and it would soon be known whether an observation of earth-tremors would tell us about the coming of an earthquake as the cracklings of a bending do about its approaching breakage. To render these experiments more complete, and to determine the existence of a terrain tide, a gravimeter might be established. I mention this because if terrain tides exist, and they are sufficiently great from a geological point of view, it would seem that they might be more pronounced and therefore easier to measure in a country like Japan, resting in a heated and perhaps plastic bed, than in a country like England, where volcanic activity has so long ceased, and the rocks are, comparatively speaking, cold and rigid, if an instrument sufficiently